

Insights from the INSP Plant Safety Evaluation Program



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DOE Plant Safety Evaluation Program

- **The U.S. INSP program began in 1992, ISA projects in 1995/6.**
- **ISA projects are beginning to produce results which confirm early program emphasis and show need for additional improvements.**
- **INSP program goal includes establishing self-sustaining nuclear safety improvement programs at Soviet-designed plants.**
- **Completion of INSP is in sight; long-term cooperative programs are needed.**



Nuclear Plant Safety: Historical Perspective

- **U.S. approach to safety has been shaped by the Three-Mile Island accident (1979).**
- **Many safety improvements have been implemented in U.S. plants as a result, e.g.:**
 - **Hardware Upgrades to Eliminate Weak Links**
 - **Additional Safety Systems (e.g. SPDS)**
 - **Symptom-Based Emergency Operating Instructions**
 - **Systematic Operator Training Programs**
 - **In-depth assessment of plant safety**



Nuclear Plant Safety: Historical Perspective

- **The ISA methodology was implemented at U.S. plants by NRC's requirement for Individual Plant Examinations (IPEs).**
- **IPE Principles:**
 - **Assessment of as-is plant condition**
 - **Involvement of, and ownership by, plant staff**
 - **Feed-back of results into plant operations**
- **The INSP plant safety evaluation projects transfer this safety assessment technology and approach (safety culture), based on U.S. experience.**



ISA Results Lead to Improved Safety

- **Kola Unit 4 (VVER-440/213)**
 - Addition of more reliable emergency feedwater system
 - Modification of ECCS procedure under high-pressure LOCAs
 - Improvement of spray system reliability
 - Installation of motor-operated valves to reduce potential operator errors
 - More frequent testing and maintenance of ECCS to ensure reliability
 - New symptom-based emergency operating procedures
(cooling during failure of high-pressure ECCS)



ISA Results Lead to Improved Safety

- **Leningrad Unit 2 (RBMK-1000)**
 - 20% increase in number of recognized safety systems
 - Retention of old service water system
 - Installation of air-cooled feedwater motors
 - Provision for alternative service water sources
 - More frequent testing and maintenance of safety systems to ensure reliability
 - New symptom-based emergency operating procedures
(providing alternatives during loss-of-service-water events)



Insights from Initial ISA Results

Preliminary ISA results for Soviet-designed reactors parallel Western experience:

- **Safety issues tend to be highly plant specific; plant-specific conditions must be examined.**
- **Documentation is not complete; needs to be established on a plant-specific basis.**
- **Operator action is a dominant risk contributor, demonstrates need for SBEOLs, training, and simulators.**



Experience from ISA Process

- **Some generic safety issues quantified (e.g., sump clogging).**
- **Safety assessments must be continually updated to keep their validity.**
- **ISA results should feed back to other activities (e.g. SBEOLs, training programs, design basis documentation (DBD), licensing, etc.).**
- **Plant management must maintain commitment to the process to improve plant safety culture.**



Reaping Full Benefits of the ISA

- **Application of the ISA insights will result in immediate safety improvements**
- **ISA results provide the technical basis for**
 - **priorities of safety improvement projects**
 - **cost/benefit assessments of continued plant operation**
- **ISA needs to be maintained (e.g. “Living PRA”) if it is to serve as a basis for continued improvements of safety (e.g. Risk Advisory Systems)**